Electric retarders

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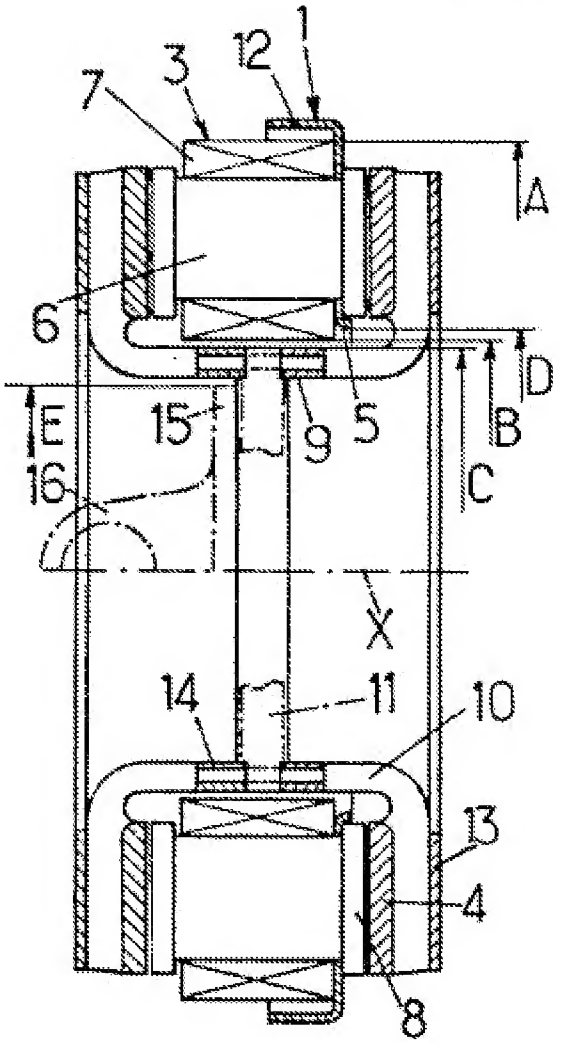
Abstract of **GB2171852**

The invention relates to an electric retarder for vehicle whose stator (1), formed essentially by an annular flange (2) supporting a ring of substantially jointing coils (3), is mounted cantilever fashion on the casing of the rear axle or the gear box of this vehicle and whose rotor comprises two magnetic material disks enclosing the stator themselves mounted cantilever fashion, through arms (10) forming ventilation fins, on a stub shaft extending from the casing. The number of coils is increased from eight to ten or twelve, which, all other things being equal, allows the diameter (D) of the opening formed in the flange and so that of the transmission shaft to be increased.

FIG.3.



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(54) Electric retarders

(57) The invention relates to an electric retarder for vehicle whose stator (1), formed essentially by an annular flange (2) supporting a ring of substantially jointing coils (3), is mounted cantilever fashion on the casing of the rear axle or the gear box of this vehicle and whose rotor comprises two magnetic material disks enclosing the stator themselves mounted cantilever fashion, through arms (10) forming ventilation fins, on a stub shaft extending from the casing. The number of coils is increased from eight to ten or twelve, which, all other things being equal, allows the diameter (D) of the opening formed in the flange and so that of the transmission shaft to be increased.

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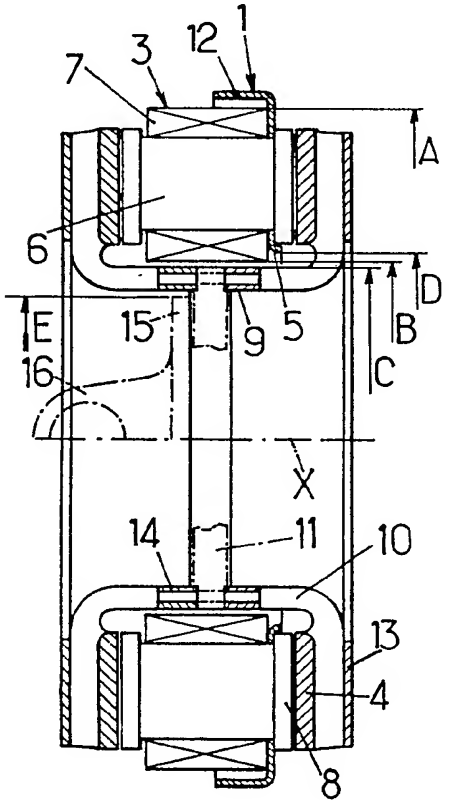

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FIG.1.

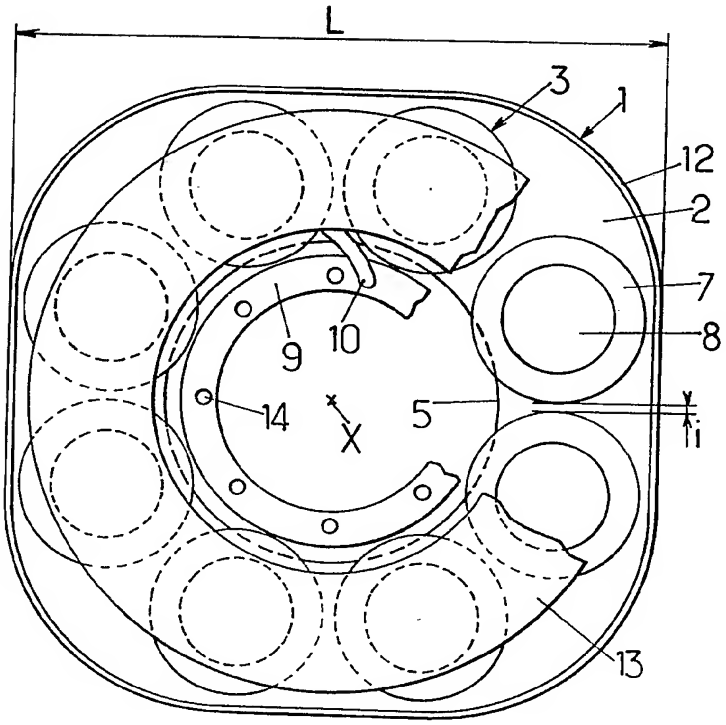


FIG.2.

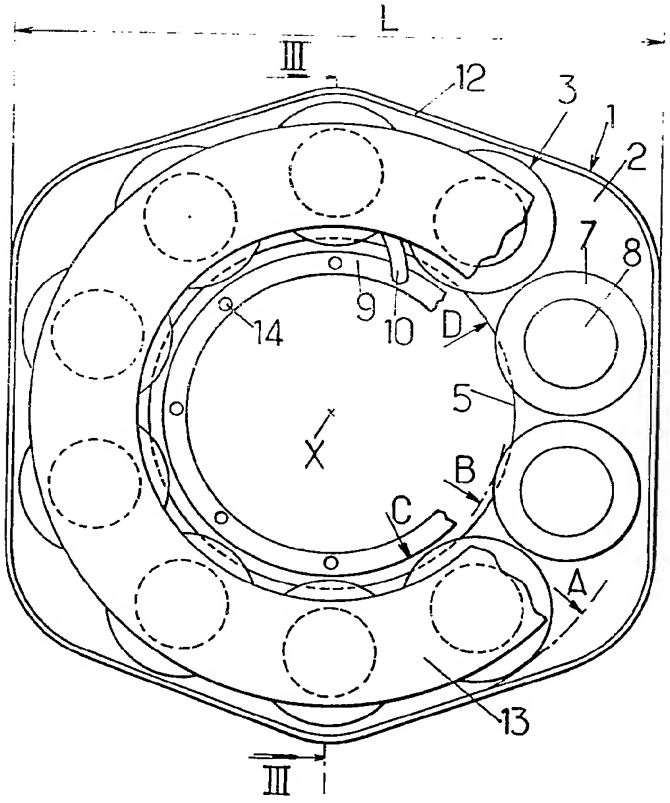
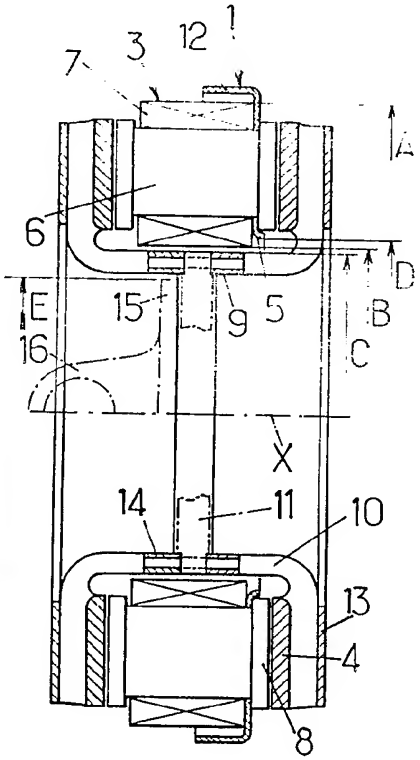


FIG.3.



SPECIFICATION

Improvements to electric retarders

The invention relates to electric eddy current retarders.

It relates more particularly to those of such retarders which are mounted directly on a gear casing of a motor vehicle transmission, such as the casing of the rear axle or the gear box of this vehicle and which comprise an annular inductor stator mounted cantilever fashion on the casing considered by means of a framework in the form of a perforated bell, and a rotor comprising two armatures made from a ferromagnetic material which enclose the stator and are both supported by a central plate itself mounted cantilever fashion on a stub shaft extending from the casing, each disk being interlocked through a ring of arms forming ventilation fingers, with a support ring fixed on said plate, and this plate being itself coupled to the end flange of a universal joint on the axial side opposite that where the stub shaft is situated.

It relates more particularly still, among the retarders considered, to those in which the annular inductor stator is formed by a ring of coils even in number, with axes parallel to that of the retarder, supported by a transverse flange of generally annular shape, each coil comprising a core cylindrical in revolution made from a magnetic material which passes through said flange and an electric wire winding which surrounds this core, these different coils defining a ring of magnetic poles with polarities alternating step by step opposite each armature disk, and the different coils being separated laterally from each other only by the small clearance required for avoiding jamming during mounting and for allowing minimum ventilation.

The advantage of retarders of this type is known, in particular in that mounting thereof on the casing and on the stub shaft considered only slightly increases the axial distance between these elements and the universal joint considered and in that they generate relatively high retarding torques for a given mass and size.

In known embodiments of these retarders, the number of inductor coils is equal to eight.

If we call:

A the diameter of the outer circle described about the different coils, which diameter is generally substantially equal to the overall width of the retarder,

B the diameter of the inner circle inscribed within the coils, which diameter is in general substantially equal to the diameter of the central hole formed in the stator flange,

and R the ratio A/B, this ratio R is greater than 2 and generally of the order of 2.15 to 2.20 for retarders of the kind considered in which thenumber of coils is equal to 8.

Thus, if the width or transverse horizontal dimension of the space available for the retarder on the vehicle, width defined for example by the two side members of the chassis of the vehicle, is equal to A, it is impossible to house inside the stator of this retarder a rotor whose ring-central plate assembly has an outer diameter C greater than A/2.

Now, this diameter C is directly related to that of the transmission shaft of the vehicle and so to the drive and deceleration torques likely to be transmitted by this shaft between the engine and the wheels of the vehicle.

The purpose of the invention is especially to increase the diameters of the rotor elements considered, as well therefore as the torques transmissible by these elements for a given overall width of the retarder.

For this, a value greater than 8, and preferably equal to ten, is given to the even number of the coils of the retarders of the kind considered, i.e. for which in particular the coils are almost jointing laterally and the diameter of the central hole formed in the stator flange is at least equal to that of the circle inscribed within the coils.

Thus, the above ratio R is less than 2 and in general of the order of 1.85.

In preferred embodiments, recourse is further had to one and/or the other of the following arrangements:

with the coils spaced apart evenly about the axis of the retarder, the ring formed by these coils is defined laterally on each side of said axis by two vertically superimposed coils and the stator flange is defined laterally by two vertical sides substantially tangential to said coils two by two,

in a retarder according to the preceding paragraph, the stator flange has an external hexagonal contour with rounded corners, which contour comprises, in addition to the two above defined vertical sides, four oblique sides substantially tangential each one to an upper-most or lower-most coil of the ring and to a coil contiguous with this endmost coil.

The invention comprises, apart from these main arrangements, certain other arrangements which are used preferably at the same time and which will be more explicitly described hereafter.

In what follows a preferred embodiment of the invention will be described with reference to the accompanying drawings in a way which is of course in no wise limitative.

Figure 1, of these drawings, shows an end view of a portion of a known electric retarder,

Figure 2 shows similarly a portion of an electric retarder constructed in accordance with the invention, and

Figure 3 is an axial section of this latter portion through III-III of Figure 2.

In all cases, an eddy current retarder with horizontal or substantially horizontal axis X is mounted cantilever fashion on the output of a

rear axle casing or gear box of a motor vehicle, said retarder comprising:

an inductor stator 1 comprising a flange of substantially annular shape 2 which supports a ring of coils 3, even in number 2n, arranged so as to form by their ends two annular successions of flat magnetic poles with polarities alternating from one to the next,

and an armature rotor comprising two ferromagnetic material disks 4 adapted for axially surrounding the stator and each travelling past a succession of poles of this stator from which they are separated by a small clearance or air gap.

Flange 2 is supported by the casing through a perforated bell shaped structure (not shown).

It is itself pierced centrally with a circular hole 5 of relatively large diameter D and at its periphery by 2n smaller holes each adapted for jointingly receiving a core 6 which forms a coil 3 with an electric wire winding 7 surrounding this core.

The cores 6 advantageously end in enlarged shoes or pole portions 8 fixed to their axial ends and defining the above magnetic poles.

The different coils 3 are dimensioned and mounted so that they are spaced apart laterally from each other by narrow gaps i, the width of these gaps being a few millimeters and generally between 2 and 5mm, so as on the one hand to avoid risks of mutual jamming of these coils during mounting and on the other to make a minimum ventilation between these coils possible.

The diameter A of the outer circle described about coils 3 is substantially equal to the overall width L of the retarder, which width is that of flange 2, this flange being itself generally defined at its periphery by a bent back reinforcement and protective edge 12.

As for the diameter B of the circle described inside the coils, it is substantially equal to the diameter D of hole 5, being generally a little less than this diameter D.

Each of the two disks 4 is connected to a ring 9 through a ring of arms 10 forming ventilation fins (a single arm being shown in Figures 1 and 2 for simplifying the drawings) and the two rings 9 are bolted to the periphery of a central plate 11 itself fixed to the stub shaft extending from the casing (not shown).

Of course, the outer diameter C of the rotor portion formed by rings 9 and by the central plate 11 must always be less than the diameter B of the circle inscribed inside the coils.

In known embodiments, the number of coils 3 is equal to 8 (Figure 1).

The ratio R between the diameters A and B is then relatively high, namely higher than 2, this ratio being generally 2.15 to 2.20.

The practical consequence of this state of affairs is that it is not possible to adopt for diameter C a value higher than L/2.

Since the diameter E of the transmission shaft of the vehicle and the value of the torques transmissible by this shaft are directly related to this diameter C, we are confronted with a limit which proves troublesome in certain constructions for which the dimension L is strictly limited, for example because of the spacing which exists between the two side members of the chassis of the vehicle if the retarder is to be housed between these side members.

To overcome this drawback, in accordance with the invention, the even number of coils 3 has been given a value greater than 8.

In the embodiment illustrated in Figures 2 and 3, this number is equal to 10, which corresponds to the formation of a ring of 10 magnetic poles facing each rotor disk 4.

Experience shows that, under these conditions, in a surprising way it is possible to obtain, for a given transverse width and a given axial length of the retarder, braking torques at least as high as with the eight coil construction, while substantially increasing the diameters B and D, and so the diameter C.

Thus, in a retarder comprising ten coils in accordance with the foregoing, the ratio R becomes less than 2, being of the order of 1.85: in other terms, the diameter C—which is extremely close to the diameters B and D - may henceforth reach a value higher than L/2, other things being equal.

To reduce as much as possible the overall width L of the retarder, the coils of the ring—then spaced evenly apart about the axis X—are advantageously disposed so that on each side of this axis there are two such coils vertically superimposed, that is to say symmetrical with each other with respect to the horizontal plane passing through said axis.

In addition flange 2, or more precisely its bent back edge 12 is defined horizontally by two vertical sides practically tangential to these superimposed coils.

The complete periphery of this flange 2—and so that of its bent back edge 12—has advantageously the general shape of a hexagon with rounded corners, the two above vertical sides being completed by four oblique sides each of which is substantially tangential, on the one hand to an uppermost or lowermost coil 3 and, on the other hand, to a coil contiguous with this endmost coil, the six sides being connected to each other by rounded sections.

There can also be seen in the drawings:

at 13, an annular rim integrally molded with each disk 4 and with the ring 9 and the corresponding arms 10, which rim defines with these arms and this disk channels for the cooling air,

at 14, bores formed in rings 9 for receiving the fixing bolts,

and at 15, the endmost flange of the universal joint 16, which flange is bolted to the central plate 11.

Purely by way of illustration, it can be mentioned that, for a retarder capable of generating braking torques of 170m.kg when cold and having an overall width L of 520 mm, the passage of 8 to 10 coils in accordance with the invention has allowed the diameter B to be increased from 240 to 280mm, the ratio R thus passing from 2.18 to 1.84 and the outer diameters of the winding 7 being themselves reduced from 140 to 120mm: this modification has allowed the diameter E of flange 15 to be increased from 180 to 220mm, that is to say that on a 170m.kg retarder a universal joint may be adopted which is usually reserved for 250m.kg retarders.

Following which, and whatever the embodiment adopted, a retarder is finally obtained whose construction is sufficiently clear from what has gone before.

This retarder presents numerous advantages with respect to those known heretofore and, in particular, the following

it allows the use of a transmission shaft and universal joints of a larger diameter for a given overall width of the retarder,

its power to weight ratio is substantially increased, being of the order of 10% when going over from 8 to 10 poles for a given overall width, for an overall consumption of electricity which is not increased.

As is evident, and as it follows moreover already from what has gone before, the invention is in no wise limited to those of its modes of application and embodiments which have been more especially considered; it embraces, on the contrary, all variants thereof particularly that where the even number of coils is twelve.

CLAIMS

1. An electric retarder mounted on a gear casing of a vehicle transmission, comprising an annular inductor stator (1) mounted cantilever fashion on the casing considered, which stator is formed by a ring of coils (3) even in number, with axes parallel to that of the retarder, supported by a transverse flange (2) of general annular shape, each coil comprising a core (6) cylindrical in revolution and made from a magnetic material which passes through said flange and a winding of electric wire (7) which surrounds this core, these different coils being separated laterally from each other only by a small clearance (i), and the flange having formed therein a central hole (5) whose diameter (D) is at least equal to that (B) of the circle inscribed by the coils and a rotor comprising two armature disks (4) made from a ferromagnetic material which enclose the stator and are both supported by a central plate (11) itself mounted cantilever fashion on a stub shaft extending from the casing,each disk being interlocked, by means of a ring of arms (10) forming ventilation fins, with a support ring (9) fixed on said plate, and this plate being itself coupled to the end flange of a universal joint on the axial side opposite that where the stub shaft is located, characterized in that the even number of the coils is greater than eight, the ratio between the diameter (A) of the outer circle described about the coils (3) and the diameter (B) of the inner circle inscribed in the coils being then less than 2.

2. Retarder according to claim 1, characterized in that the even number of coils is equal to 10.

3. Retarder according to claim 1, wherein the coils (3) are spaced apart evenly about the axis (X) of the retarder, characterized in that the ring formed by these coils is defined laterally on each side of said axis by two vertically superimposed coils and in that the stator flange (2) is defined laterally by two vertical sides substantially tangential to said coils two by two.

4. Retarder according to claim 3, characterized in that the stator flange (2) has an external hexagonal contour with rounded corners, which contour comprises, in addition to said two above defined vertical sides, four oblique sides substantially tangential each one to an uppermost or lowermost coil of the ring and to a coil contiguous with this endmost coil.

5. An electric retarder substantially as hereinbefore described with reference to Figures 2 and 3 of the drawings.

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